CONFERENCE ON DISARMAMENT

CD/1054
4 February 1991

Original: ENGLISH

LETTER DATED 4 FEBRUARY 1991 FROM THE REPRESENTATIVES OF INDONESIA, MEXICO, PERU, VENEZUELA, YUGOSLAVIA AND SRI LANKA ADDRESSED TO THE PRESIDENT OF THE CONFERENCE ON DISARMAMENT TRANSMITTING DRAFT PROTOCOL II OF AMENDMENT TO THE TREATY BANNING NUCLEAR WEAPON TESTS IN THE ATMOSPHERE, IN OUTER SPACE AND UNDER WATER

We have the honour to refer to our letter of 5 August 1988 containing our proposal (document CD/852) to amend the Treaty Banning Nuclear Weapons Tests in the Atmosphere, in Outer Space and under Water. During the first phase of the Amendment Conference, held in New York from 7 to 18 January of this year, our six countries, co-authors of the initiative to amend the Treaty, submitted for consideration of the Parties a draft Protocol II on verification of our proposed amendment.

During the discussion, it was suggested that, without prejudice to the decision taken by the Amendment Conference, the draft Protocol II be considered also by the Conference on Disarmament. We therefore request you that it be distributed as an official document of the Conference on Disarmament and made available to the Ad Hoc Committee on a Nuclear Test Ban for further consideration.

Finally, in view of the important contribution made in this regard by the Ad Hoc Group of Scientific Experts to Consider International Co-operative Measures to Detect and Identify Seismic Events, we request you that this document be made available to that Group so as to enable it to examine the relevant aspects of draft Protocol II.

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DRAFT PROTOCOL II OF AMENDMENT TO THE TREATY BANNING NUCLEAR WEAPON TESTS IN THE ATMOSPHERE, IN OUTER SPACE AND UNDER WATER

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PROTOCOL II

PREAMBLE

Pursuant to and in implementation of the Treaty Banning Nuclear Weapons Tests in the Atmosphere, in Outer Space and under Water, as amended, hereinafter referred to as the Treaty, the Parties hereby agree upon the following measures to assist in the verification of compliance with the obligations assumed.

Part I: Treaty institutions

Article I. The Organization

1. The Parties hereby establish an Organization for the purpose of assisting in the verification of compliance with the Treaty.

2. The Organization shall compile information and make observations pertinent to the Treaty, and shall report the information and observations to each Party to the Treaty.

3. Each Party shall co-operate fully with the Organization.

4. The principal organs of the Organization shall be the Assembly and the Secretariat.

5. Costs of the Organization shall be borne by the Parties in the same ratio as established by the annual assessment of United Nations dues, unless the Assembly, by a majority of two thirds, establishes a different schedule of charges.

6. The Organization shall enjoy in the territory of each Party the legal capacity and the privileges and immunities appropriate for the exercise of its functions. Representatives of the Organization and Parties' representatives to the Organization shall enjoy the privileges and immunities appropriate for the exercise of their functions.

Article II. The Assembly

1. Each Party shall be a member of the Assembly.

2. The Assembly shall meet at least once annually, and shall also meet whenever requested by the Secretary-General or by at least one tenth of the Parties.

3. The Assembly shall approve or modify the budget of the Organization.

4. The Assembly shall establish the policies and practices of the Organization.

5. The Assembly shall elect the Secretary-General for a five-year term.

6. The Assembly shall create a Technical Committee to assist in its work.

(a) Each member of the Assembly shall have the right to designate a representative to the Technical Committee.

(b) The Technical Committee shall review the technical operations of the Secretariat, assess the Secretariat's reports and recommendations, evaluate the performance of the Secretariat, and make recommendations to the Assembly regarding possible revision of the verification measures with a view to enhancing their effectiveness or reducing their cost.

(c) The Technical Committee shall meet at least four times per year.

(d) The Technical Committee shall be organized into Sub-Committees, with each Sub-Committee having principal responsibility for one branch or verification technology or means of Treaty verification.

7. The Assembly shall approve, modify or reject the recommendations of the Technical Committee and shall determine whether to alter the Organization's procedures.

8. Each Party shall have one vote in the Assembly. All decisions shall be taken by a majority of those voting, unless the Assembly, by a majority of two thirds, approves a different standard. The Assembly shall adopt its own rules of procedure.

Article III. The Secretariat

1. The Secretariat shall implement the verification measures contained in this Protocol and the additional measures that may be approved by the Assembly.

2. The Secretariat shall be headed by a Secretary-General.

3. The Secretariat shall have appropriate staff and resources to carry out the daily functions of the Organization, to compile and maintain the data gathered and received by the Organization, and to make observations pertinent to the Treaty.

4. The paramount consideration in the employment of the staff and in the determination of the conditions of service shall be the necessity of securing the highest standards of efficiency, competence, and integrity. Due regard shall be paid to the importance of recruiting the staff on as wide a geographical basis as possible.

5. In the performance of their duties, the Secretariat and the staff shall not seek or receive instructions from any Government or from any other authority external to the Organization. They shall refrain from any action which might reflect upon their position as international officials responsible only to the Organization. Each Party undertakes to respect the exclusively international character of the responsibilities of the Secretariat and staff and not to seek to influence them in the discharge of their responsibilities.

6. The Secretariat shall present an annual report to the Assembly and periodic reports to the Technical Committee.

7. The Secretariat shall prepare a proposed budget for approval by the Assembly.

8. The Secretariat shall designate appropriate senior staff officials to provide expert assistance to the Technical Committee.

9. The Secretariat shall establish the following Sections responsible for implementing verification measures pertinent to the prohibition of nuclear explosions in various environments:

(a) Section A, in the atmosphere;

(b) Section B, in outer space;

(c) Section C, under water; and

(d) Section D, under ground.

The Secretariat may establish other Sections and offices, as appropriate.

10. Each Section of the Secretariat shall develop a working description of the phenomena associated with nuclear explosions in each environment, which are observable by global monitoring networks, by localized monitoring, by on-site inspections or by other means. Each Section shall compile a data set recording every actual observation of such phenomena, together with a summary of available technical and other data regarding them.

11. Each Section of the Secretariat shall compile similar working descriptions of other phenomena associated with natural and legitimate events, activities and conditions that might create ambiguity or uncertainty regarding Treaty compliance, which are observable by global monitoring networks, by localized monitoring, by on-site inspections or by other means. Each section shall compile a data set recording every actual observation of such phenomena, together with a summary of available technical and other data regarding them.

12. The Secretariat shall compile a registry of reports submitted by the Parties regarding their planned or completed activities that might generate the phenomena described in paragraphs 10 and 11.

Part II: Operating procedures

Article IV. Monitoring techniques

1. The Secretariat shall establish permanent global monitoring networks, as specified in annex 1.

2. The Secretariat shall consider and, as appropriate, shall implement temporary, localized monitoring, as specified in annex 2.

3. The Secretariat shall consider and, as appropriate, shall implement on-site inspections, as specified in annex 3.

4. The Secretariat shall consider and, as appropriate, shall implement inspections to corroborate the information reported to it by the Parties, as specified in annex 4.

5. The Secretariat shall undertake research related to the Treaty. Parties shall co-operate with the Secretariat in the design, conduct and analysis of research projects that could contribute to the improvement of the technology of verification.

6. The Secretariat shall investigate the feasibility of establishing additional monitoring stations or equipment, including satellite-based or aircraft-based systems, and of obtaining prompt access to relevant data collected by individual States. States shall co-operate to the maximum extent possible in providing relevant data.

Article V. Reports

1. Each section of the Secretariat shall report monthly regarding:

(a) Additions and changes to the working descriptions, data sets, and registries it compiles;

(b) Observations it makes through permanent global monitoring networks, temporary localized monitoring, on-site inspections, and other means; and

(c) Decisions it makes regarding the application of various monitoring mechanisms and the corroboration of information supplied to it by Parties.

2. Each section of the Secretariat shall report immediately whenever, in the exercise of its functions, it detects evidence related to a possible violation of the Treaty.

3. Each Section report shall be provided to each Party and to each representative on the Technical Committee.

4. The Technical Committee shall review the reports and make recommendations to the Assembly.

Part III: Obligations of the Parties

Article VI. Co-operative measures

1. Each Party shall permit the establishment and operation on its territory of permanent global monitoring networks as specified in annex 1.

2. Each Party shall permit the establishment and operation on its territory of temporary localized monitoring as specified in annex 2.

3. Each Party shall permit on-site inspection of its territory and activities, as specified in annex 3.

4. Each Party shall provide information to the Secretariat, and shall permit the Secretariat to corroborate such information, as specified in annex 4.

5. Each Party shall assist the Secretariat in conducting monitoring activities in areas outside the jurisdiction of any Party. Each Party shall promptly provide equipment, personnel and other support requested by the Secretariat for the conduct of such operations.

6. Each Party shall co-operate fully and in a timely fashion with the Secretariat's requests for information, support or other assistance in conducting the verification procedures of this Protocol.

7. Each Party shall designate a competent national organization for the purpose of serving as liaison with the Secretariat, providing the required information, and responding to requests for assistance.

Article VII. Additional monitoring procedures

1. For the purpose of providing assurance of compliance with the provisions of the Treaty, each Party shall use national technical means of verification at its disposal in a manner consistent with generally recognized principles of international law.

2. Each Party undertakes not to inferfere with the national technical means of verification of the other Parties operating in accordance with paragraph 1 of this article.

3. Each Party undertakes not to use deliberate concealment measures which impede verification by national technical means of compliance with the provisions of the Treaty.

4. Two or more Parties may agree upon additional arrangements for the purpose of enhancing confidence in compliance with the Treaty, to be effective only among themselves, provided that those arrangements do not in any way interfere with the operations of the Organization.

5. If a multilateral verification system is established within the framework of the United Nations, the Organization shall determine the appropriate relationship between the current Treaty structures and the new agency or institutions thereby created.

Part IV: Final provisions

Article VIII. Annexes

The Annexes and Appendices shall be integral parts of this Protocol.

Annex 1: Permanent global monitoring network

Article I. Monitoring stations

1. The permanent global monitoring network shall initially include stations as indicated in appendix 1. Thereafter, additional stations may be added, as the Assembly or Secretariat determines to be necessary.

2. The Secretariat shall determine what types of monitoring equipment shall be emplaced at each station. As appropriate, the Secretariat may designate sensors capable of performing seismic monitoring, radioisotope air and precipitation sampling, ionospheric disturbance active sensing, outer space monitoring, and other monitoring functions approved by the Assembly.

3. The equipment included in the stations shall be of the best available quality and reliability, as determined by the Secretariat. The Secretariat may upgrade the equipment at the stations as improved equipment becomes available and financially feasible.

4. The network shall have at least the reliable capability to detect, locate and identify a tamped explosion of 500 tons or more of TNT equivalent anywhere in the world and of 5 tons or more of TNT equivalent within the limits of national jurisdiction of any State which has conducted more than one nuclear explosion.

5. The network shall have the capability to detect the release of significant quantities of relevant radioisotopes anywhere in the world.

6. The Secretariat shall procure the equipment for the stations. Any Party may donate stations or equipment to the global network.

7. The Secretariat shall field test the operation of the global monitoring network, assessing the accuracy and sensitivity of the equipment. Each Party shall co-operate in the conduct and evaluation of these tests.

Article II. Station operations

1. Each Party shall operate and maintain all stations on its territory. The Secretariat shall operate and maintain all stations not based on the territory of a Party.

2. The Secretariat shall train the personnel who operate and maintain the stations.

3. The Secretariat shall have immediate access to the stations and equipment at all times. The Secretariat shall inspect the stations and equipment to ensure appropriate operation and maintenance.

4. If the Secretariat finds that the host State is unable to operate and maintain a station appropriately, the Secretariat shall perform the operation and maintenance functions until the host State is able to do so.

5. Each station shall transmit its acquired data to the Secretariat headquarters in real time through a high-quality satellite-based data system

designated by the Secretariat. Data shall be transmitted in unencrypted form, and a secure authentication procedure shall be implemented to reveal any tampering or degradation in the quality of the data stream.

6. All data transmitted to the Secretariat shall be promptly available to all Parties.

7. Each station and its equipment shall be tamper-resistant and tamper-indicating.

8. Each station shall be equipped with back-up sensors, recording equipment, power supplies and other items as directed by the Secretariat.

Article III. Site selection

1. The Secretariat shall designate a large area (approximately 200 square kilometres) within which the permanent global monitoring station shall be located.

2. The host State shall then designate five small areas (each approximately 10 square kilometres) within the large area.

3. The Secretariat shall then designate one of the five small areas for establishment of the station. The Secretariat shall then select the specific site for the station, after consultation with the host State.

4. Areas and sites shall be selected based upon their suitability for performing the missions of the station. Sites shall be seismically quiet and shall if possible provide access to bed-rock.

5. Similar procedures shall apply to the relocation of a station that the Secretariat has found to be inadequate or inappropriate, and to the addition of supplementary stations to the global network.

6. The host State shall construct the station and install the equipment at the direction and under the supervision of the Secretariat.

Annex 2: Temporary localized monitoring

Article I. Initiation of local monitoring

1. The Secretariat may decide to undertake temporary localized monitoring whenever:

(a) There have been two or more events in an area for which the data acquired by the global monitoring network did not fit some elements of the Secretariat's working description of a natural or legitimate event, activity or condition;

(b) There have been one or more events in the area for which the data acquired by the global monitoring network did fit some elements of the Secretariat's working description of a nuclear explosion;

(c) There has been an on-site inspection in the area, and additional information-gathering would help confirm the nature of the ambiguous event or events; or

(d) The Secretariat otherwise determines that confidence in compliance with the Treaty would be enhanced by operation of additional localized monitoring.

2. The purposes of the temporary localized monitoring shall be to clarify an ambiguous situation, to supplement the data provided by the global network, and to demonstrate the good faith compliance of all Parties to the Treaty.

Article II. Station equipment and operations

1. The Secretariat shall determine what types of localized monitoring shall be undertaken, what equipment shall be utilized, where the equipment shall be emplaced, what the capabilities and sensitivities of the equipment shall be, and what local stations shall be constructed to support the operations. Equipment may be similar to that operated at the global network, and additional types of equipment may be installed and operated as appropriate.

2. The Secretariat shall procure, install, operate, and maintain the equipment and the station. If the Secretariat determines that construction or modification of local buildings is necessary, the host State shall perform those services at the direction and under the supervision of the Secretariat. If the Secretariat determines that the station should be operated for a sustained period of time, the Secretariat may delegate the operation and maintenance to the host State, under terms similar to those applicable to the operation of the permanent global monitoring network stations.

3. Data from the temporary stations shall be duplicated on the site and a copy provided to the host State. Data shall be transmitted promptly and securely to the Secretariat headquarters.

4. Procedures for ensuring that the data are authentic and secure shall be similar to those adopted for the permanent global monitoring network.

5. When the Secretariat determines that localized monitoring is no longer necessary, the station may be dismantled or the host State may elect to maintain its operations or convert it to other purposes. Any equipment supplied by the Secretariat shall be returned to it.

Article III. Site selection

1. The Secretariat shall designate a large area (approximately 20 square kilometres) within which the temporary localized monitoring station shall be located.

2. The host State shall then designate five small areas (each approximately 1 square kilometre) within that large area.

3. The Secretariat shall then designate one of the five small areas for establishment of the station. The Secretariat shall then select the specific site for the station, after consultation with the host State.

4. Areas and sites shall be selected based upon their ability to perform the missions of the station. Sites shall be seismically quiet and shall if possible provide access to bed-rock.

5. Similar procedures shall apply to the relocation of a station that the Secretariat has found to be inadequate or inappropriate.

Annex 3: On-site inspection

Article I. Initiation of on-site inspection

1. Any Party may submit to the Secretariat information that it believes may be relevant to compliance with the obligations of the Treaty and that may concern the necessity for conducting on-site inspection. Any Party may suggest that the Secretariat undertake an on-site inspection of the territory or activities of another Party.

2. The Secretariat shall consider all information submitted to it and shall promptly respond to all suggestions for on-site inspection. If the Secretariat decides not to undertake on-site inspection, it shall report its decision to the Assembly along with all other reports. If requested to do so by one fifth of the Parties to the Treaty, the Secretariat shall make a special report on the subject within 24 hours.

3. The Secretariat shall undertake on-site inspection, whether or not a Party has suggested it, whenever:

(a) Data from the global permanent monitoring network or the temporary localized monitoring indicate the occurence of an event that does not conform entirely to the Secretariat's working description of a natural or legitimate event, activity or condition and that does conform at least in part to the working description of a nuclear explosion; and

(b) The data suggest that the energy released in the event is either:

(i) Over 1,000 tons of TNT equivalent yield, or

(ii) A smaller event for which the selection algorithm indicates that on-site inspection should be conducted.

4. The selection algorithm for smaller events shall rely upon probabilistic sampling such that the likelihood of on-site inspection is higher when:

(a) The event is larger;

(b) There are important respects in which the event does not conform to the working description of a natural or legitimate event, activity or condition;

(c) There are important respects in which the event does conform to the working description of a nuclear explosion;

(d) There have been other similar events in the area that have not been the subject of on-site inspection or temporary localized monitoring; and

(e) The event occurs on the territory of a State that has conducted more than one nuclear explosion.

5. If the Secretariat determines to undertake an on-site inspection, the host State may appeal the decision to the Assembly, which shall consider the matter immediately. The inspection shall proceed while the Assembly is considering the appeal. If the Assembly concludes by a two thirds vote that the on-site inspection is not warranted, then the on-site inspection shall be abandoned promptly.

6. The Secretariat may issue an order requiring the host State:

(a) To leave all, or specified, vehicles, buildings, personnel, equipment and other items in place in the inspection area; and

(b) To refrain from undertaking any, or specified, other changes in circumstances of the inspection area, pending the arrival of the inspection personnel.

7. The Secretariat shall provide the following information to the host State 24 hours prior to the scheduled arrival of the inspectors at the host State's point of entry:

(a) The point of entry to be used;

(b) The estimated time of arrival and means of arrival at the point of entry;

(c) The full names of the inspectors and the transport crew, each person's gender, date of birth, place of birth, and passport number;

(d) The location to be inspected.

8. The host State shall transport the inspectors from the point of entry to the location of the inspection within 24 hours after the inspectors' arrival at the point of entry.

Article II. Conduct of on-site inspection

1. The Secretariat shall determine the area to be inspected, the duration and dates of the inspection, and the size and composition of the inspection team. The Secretariat shall designate the individual members of the inspection team.

2. The host State shall provide the inspectors with immediate and uninhibited access to the entirety of the inspection area, and to all vehicles, buildings, personnel, equipment and other items within it. The host shall provide the inspectors with transportation to, from, and within the inspection area; with appropriate housing and sustenance during the inspection; with the best quality maps available of the inspection region; and with additional logistical and safety support as necessary.

3. The inspectors shall supply their own tools and equipment for use in the inspection. The host State may examine the tools and equipment in the presence of the inspectors at the start of the inspection, and all tools and equipment shall be kept in secure storage facilities while not in use.

4. Inspectors shall be entitled to gather information they consider relevant, including, but not limited to:

(a) Taking photographs with ordinary visible-light cameras and other equipment (including video equipment);

(b) Collecting samples of air, soil, water, flora, and fauna;

(c) Surveying the area via helicopter, fixed-wing aircraft, and suitable terrestrial vehicles;

(d) Digging holes for the emplacement of sensing equipment. The data acquired in the inspection shall be used exclusively for purposes of Treaty inspection.

5. The inspectors shall have the diplomatic privileges and immunities customarily accorded to persons of their status performing similar functions under other international agreements.

6. The inspection team shall enjoy prompt, secure communications with the Secretariat headquarters. The inspection team may elect to bring its own communications equipments or to rely upon that provided by the host State.

7. The host State may designate personnel to accompany the inspectors during the performance of their duties, including the gathering of information under paragraph 4 of this article, and to replicate their observations and measurements, provided that these personnel do not interfere with the expeditious and effective conduct of the inspection.

8. If the host State considers that particular aspects of the inspection are inappropriately infringing upon its sovereignty or rights, it may lodge a complaint with the Assembly, which shall consider the question promptly. Unless the Assembly determines otherwise, by a two-thirds vote, the Secretariat shall be authorized to continue with the questioned inspection procedures.

9. Before leaving the inspection area, the inspection team shall complete a brief written report summarizing its activities and the data it has collected. A copy of this report shall be provided to the host State before the team's departure. The host State may append a commentary, either at that time or subsequently.

10. The Secretariat may include public or journalistic members on the inspection team. The inspections will be further open to public and journalistic observation as the host State considers appropriate, provided that the observers do not inhibit the expeditious and effective conduct of the inspection.

Annex 4: National data provided to the Secretariat

1. Within one year after the entry into force of the Protocol, each Party shall provide to the Secretariat the following information regarding every nuclear explosion undertaken by it or within its national jurisdiction:

(a) The geographic co-ordinates and height or depth of the explosion;

(b) The nature of the surrounding medium and seismic transmission materials;

(c) The type, yield, nature, and purpose of the explosion;

(d) The date and time of the explosion.

2. Within one year after the entry into force of the Protocol, and within one month after each subsequent incident, each Party shall provide to the Secretariat the following information regarding every natural and legitimate event, activity and condition undertaken by it or occurring within its territory that might create ambiguity or uncertainty regarding Treaty compliance:

(a) The date and time of the incident;

(b) The geographic co-ordinates and height or depth of the incident;

(c) The nature of the surrounding medium and seismic transmission materials;

(d) The nature and size or extent of the incident.

3. Within one year after the entry into force of the Protocol, and within one month after the discovery or creation of any subsequent items, each Party shall supply the Secretariat with the following information regarding any large underground cavities created or discovered by it or occurring within its territory:

(a) The geographic co-ordinates and depth of the cavity;

(b) The size and rough shape of the cavity;

(c) The date of creation or discovery of the cavity;

(d) The nature of the surrounding medium and seismic transmission materials;

(e) The purpose or function of the cavity;

(f) The nature of any contents of the cavity.

4. Each party that has conducted more than one nuclear explosion shall provide to the Secretariat the following information regarding all chemical explosions greater than 3 tons of TNT equivalent occurring anywhere under its jurisdiction and control; and each other Party shall provide the following information regarding all chemical explosions greater than 300 tons of TNT equivalent occurring anywhere under its jurisdiction and control:

(a) The geographic co-ordinates and depth of the explosion;

(b) The nature of the surrounding medium and seismic transmission materials;

(c) The nature and quantity of the explosive used;

(d) The purpose of the explosion;

(e) The explosive power of the event;

(f) The date and time of the explosion;

(g) The mode of explosion (ripple fire or otherwise).

5. The Party shall provide the information specified in paragraph 4 to the Secretariat one month before the scheduled explosion. If the planned parameters are altered, the Party shall notify the Secretariat one week before the event. If the planned parameters are altered again, the Party shall notify the Secretariat 24 hours before the event. If the actual event departs from the planned and reported parameters, the Party shall notify the Secretariat within 24 hours after the event. If there is an accidental, unauthorized or natural explosion of comparable force, the Party shall notify the Secretariat immediately and shall provide the same types of information as soon as possible and no later than one month after the event.

6. Within 12 hours after any Party launches a space vehicle, it shall provide to the Secretariat all the registry information specified in the 1975 Convention on Registration of Objects Launched into Outer Space.

7. Each Party shall notify the Secretariat immediately whenever a vertical shaft greater than 1 metre in diameter and greater than 200 metres in depth is drilled at any location within its jurisdiction and control.

8. Each Party shall notify the Secretariat immediately whenever a horizontal tunnel greater than 1 metre in diameter and having an overburden of greater than 200 metres is drilled at any location within its jurisdiction and control.

9. The Secretariat shall develop and promulgate standardized forms through which the Parties shall report the information required by this annex. The Secretariat shall advise Parties regarding conformity with reporting forms and procedures, provide training and assistance in completing the forms, and modify the forms as appropriate.

10. The Secretariat shall have the power to undertake corroboration visits, to confirm the accuracy of the information reported under this annex and to observe activities and circumstances reported.

Appendix 1: Stations of permanent global monitoring network

Preliminary list of seismic monitoring stations

From a seismic monitoring perspective, there are two basic types of geophysical terrain: (a) cratons and shields, stable platforms, and deep ocean islands; and (b) rift zones, orogenic belts (active mountain building areas), salt domes, and unconsolidated sedimentary deposits.

Non-nuclear-weapon States

Protocol II calls for the seismic monitoring of non-nuclear States at the level of 0.5kt tamped. A yield of 0.5kt corresponds to a seismic wave magnitude of 3.5mb, assuming the shot to be full tamped in hard rock. Thus, the network must be capable of detecting a magnitude 3.5mb event anywhere.

In the non-nuclear States "quality-2" stations would be used for monitoring. Quality-2 stations are current off-the-shelf high-technology stations. They consist of a nine element broad-band and three component low-noise seismometers. The individual elements are typical of a modern station, including feedback broad-band seismometers and direct digital recording. As part of a global network, quality-2 stations can monitor 3.20 million sq. km. of type-A terrain and 1.57 million sq. km. of type-B terrain down to the magnitude of 3.5mb.

1.1. One hundred and two of the Parties are smaller than 1.57 million sq. km and may therefore be monitored by a single seismic monitoring station. Indeed, in places where several small States border each other it may not be necessary that each State host a station. Mutually agreed regional arrangements that reduced the total number of stations without diminishing overall monitoring capability could be submitted to the Assembly for approval.

1.2. Four African States are larger than 1.57 million sq. km. but smaller than 3.2 million sq. km. (Algeria, Libyan Arab Jamahiriya, Sudan and Zaire); since they consist of primarily type-A terrain, they can each be monitored with a single quality-2 station as well.

1.3. The remaining eight non-nuclear States would require more than one station:

Argentina	2 stations
Australia	3 stations
Brazil	4 stations
Canada	4 stations
India	2 stations
Indonesia	2 stations
Iran	2 stations
Mexico	2 stations
Total	21 stations

The cost for the stations and instrumentation placed in non-nuclear States would be approximately $US 50.8 million ($US 0.4 million per quality-2 station).

Nuclear-weapon States

The Protocol calls for seismic monitoring of nuclear-weapon States at the level of 0.005kt fully tamped explosion in hard rock. This yield was selected to correspond approximately to a 0.2kt nuclear explosion in a large cavity (i.e. decoupled). A network capable of detecting down to 1.7mb is required in this case.

"Quality-1" stations would be installed in the nuclear testing States. Quality-1 stations are state-of-the-art research tools. They utilize a three component broad-band borehole seismometer supplemented by four single-element outstations and a three component surface seismometer at the top of the borehole. Quality-1 stations are capable of monitoring 0.438 million sq. km. of type-A terrain and 0.220 million sq. km. of type-B terrain down to the magnitude of 1.7mb.

2. The nuclear testing States would require:

United Kingdom	1 station */
United States	20 stations
Soviet Union	38 stations
Total	59 stations

*/ The normal requirement for a nation of the size and terrain of the United Kingdom would be one quality-1 station. It may be, however, that good, low-noise sites will be difficult to find in the United Kingdom, necessitating one or two more stations.

The cost for the stations and instrumentation placed in nuclear testing States will be approximately $US 59 million ($US 1 million per quality-1 station).

International territory

3. Thirty-three quality-1 stations would be placed in international territory, primarily to monitor ocean areas, at a cost of approximately $US 33 million.

Summary

1.	Seismic stations for non-nuclear States	127 stations
2.	Seismic stations for nuclear testing States	59 stations
3.	Seismic stations for international territory	33 stations
	Total number	219 stations

1.	Cost for stations in non-nuclear States	$US 50.8 million
2.	Cost for stations in nuclear testing States	$US 66.0 million
3.	Cost for stations in international territory	$US 33.0 million
	Total cost	$US 149.8 million

By comparison, a single nuclear-weapon-test explosions cost $US 30-100 million.